

## REMARKS

Claims 1-25, 27-40, and 42-59 are now pending in the application. Claims 26 and 41 have been cancelled. Claims 1, 22, 25, 32, 33, and 46 have been amended to more particularly point out and distinctly claim the present invention. Support for the amendments to these claims can be found throughout Applicant's specification as originally filed, for example, at Paragraphs 19, 21, 22, 29, and 33. The Examiner is respectfully requested to enter these amendments and to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

## REJECTION UNDER 35 U.S.C. § 103

Claims 1-32, 39, and 42-45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Johnson et al. (U.S. Pat. No. 5,126,089), hereinafter "Johnson" in view of Madono (U.S. Pat. No. 4,584,328), hereinafter "Madono". This rejection is respectfully traversed.

Independent Claims 1, 22, and 32 have been amended to recite a common feature of the present invention; in particular a disintegration additive consisting essentially of an ionic compound. The disintegration additive promotes disintegration of a casting material (that additionally comprises foundry sand and a binder) in the presence of an electrolyte and an applied voltage, *i.e.*, during electrolytic processing. Thus, by including a disintegration additive that comprises an ionic compound capable of ionizing in the presence of an electrolyte and an applied voltage in a casting material, the removal of residual casting material from a cast part can be achieved efficiently and effectively via electrolytic processing. The removal of residual casting material by prior

art methods can be costly and inefficient in contrast to the presently claimed invention. One feature of the present invention is the particular suitability of the disintegration additive consisting essentially of an ionic compound to promote disintegration and ion mobility within the casting material during electrolytic processing to promote efficient disintegration of the casting material. None of the cited references disclose, suggest, or provide a motivation to select and use a disintegration additive consisting essentially of an ionic compound in a casting material for this purpose to arrive at the invention as claimed in Claims 1-25 and 27-31 reciting casting material compositions. Further, none of the cited references discloses or provides any motivation whatsoever to arrive at the methods of forming a metal part that include electrolytically removing a casting material, nonetheless to provide a casting material modified to include a disintegration additive consisting essentially of an ionic compound that promotes disintegration via electrolytic processing, such as those generally recited in Claims 32-40 and 42-59.

The Johnson reference discloses the use of steam (atmosphere having 80 – 100% relative humidity) to break down binder resin to achieve the breakdown of the casting cores. In fact, the main objective and teaching of the Johnson reference relates to breaking down the binder of the casting material. See e.g., Abstract, Col. 1 lines 29-31, Col. 3 lines 4-5, Col. 4 lines 34-35. The Johnson reference provides no disclosure or suggestion for modifying a casting material to include a disintegration additive. Further, the Johnson reference provides no motivation or suggestion to incorporate a disintegration additive consisting essentially of an ionic compound that facilitates ion mobility in the presence of an applied voltage and an electrolyte, where the

disintegration additive promotes disintegration of the casting material during electrolytic processing.

Further, the Modano reference does not provide for the deficiencies of the Johnson reference. The Modano reference likewise relates to weakening of the binder resin in casting material. To this end, the Modano reference includes alkali based compounds that are "an accelerator for decomposition of the phenolic resin" that are microencapsulated with plastic (Col. 2 lines 1-2, 17-18, for example). The Modano reference teaches that if additives are included in a casting material, their interaction with water should be avoided. To this end, the Modano reference teaches that additive materials should be microencapsulated with plastic to avoid interaction with any water. There is no suggestion in Modano that a non-encapsulated additive for a casting material would be effective, as Modano teaches various disadvantages that should be avoided by encapsulating the additive. See e.g., Col. 2 lines 24-51. Modano does not disclose or suggest a casting material having a disintegration additive that consists essentially of an ionic compound, which excludes disintegration additives that comprise substantial amounts of other materials, such as plastics.

The Examiner states that "Madono teaches that the plastic capsule is not an issue because the capsule thermally decomposes during [the] casting process such as pouring molten metal into the mold containing the sand core; and then the additive reacts with the binder in the casting material and accelerates the breakdown of binder bonded core." Applicants have amended Claims 1, 22, and 32 and their dependent claims to clarify that the disintegration additive consists essentially of an ionic compound, to emphasize that the disintegration additive promotes disintegration of the

casting material in the presence of an electrolyte and applied voltage. The Modano reference generally suggests that the plastic covering can volatilize during casting to permit interaction between the binder and the additive within the casting material. However, there is no certainty that a plastic encapsulated additive will lose all of its plastic coating during the casting process, such that it is a suitable candidate as an ionizable disintegration additive. The selection of a plastic encapsulated additive would contravene the rationale for including a disintegration additive for a casting material that ultimately functions to promote disintegration when exposed to an electrolyte and applied voltage.

Further, Madono has no disclosure or suggestion of any electrolytic processing whatsoever. Absent impermissible hindsight, one of skill in the art would have no reason or motivation to select such a plastic encapsulated material for use in a material where the additive must ionize and interact with an electrolyte. Hence, neither the Hoffman reference, nor the Modano reference, either singly or in combination, provides any objective disclosure, motivation or suggestion to arrive at a disintegration additive that consists essentially of an ionic compound that promotes disintegration of a casting material in the presence of an electrolyte and an applied voltage.

Further, with regard to amended independent Claim 32, the claimed invention is a method of forming a metal part, which includes removing residual mold material from a surface of the metal part via electrolytic processing, where the disintegration additive promotes disintegration of the mold material during electrolytic processing. Neither Johnson nor Modano provide any disclosure, suggestion, or motivation for a method of

forming a part that entails removal of residual mold material from the part by electrolytic processing.

As such, Applicants respectfully submit that neither Johnson, standing alone or in combination with Modano, sufficiently establishes a *prima facie* case of obviousness, and as such, neither reference renders amended independent Claim 1 or its dependent Claims 2-21, independent Claim 22 or its dependent Claims 23-25 and 27-31, or independent Claim 32 obvious. Applicants respectfully request reconsideration of the claims.

Claims 33-38, 40-41 and 46-59 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Johnson in view of Madono and further in view of Hoffman Jr. et al. (U.S. Pat. No. 6,264,823), hereinafter “Hoffman”. This rejection is respectfully traversed.

As discussed above, independent Claims 32 and 46 have been amended to clarify the claimed invention. Claim 41 has been cancelled. Thus, Claims 33-38 and 40 which depend upon Claim 32 and Claim 46, and its dependent Claims 47-59, recite a common feature of a residual casting material including a disintegration additive that consists essentially of an ionic compound that promotes disintegration of the residual casting material in the presence of an electrolyte and an applied voltage. The deficiencies of both the Johnson reference and the Madono reference are discussed in the context of the rejections above. Neither reference has any disclosure, suggestion, nor motivation to provide a disintegration additive that consists essentially of an ionic compound that promotes disintegration of a residual casting material. Further, neither reference discloses exposing a residual casting material to electrolytic processing

conditions to interact with the disintegration additive to efficiently and effectively remove any residual casting material.

With regard to the Hoffman reference, there is no explicit disclosure of using the devices or methods to electrolytically clean a cast part of residual casting material. There is no suggestion or motivation in Hoffman to employ the disclosed electrolytic device to remove residual casting material from a cast metal part. The Hoffman reference only discloses electrolytically cleaning conductive bodies to remove thin coatings, for example, rust, scale, smut, petroleum derived contaminants, oils, greases, flux, carbonization, paint, dirt, and the like. Col. 1, lines 29-34, for example. There is no objective teaching or suggestion in Hoffman that such a device might be capable of or suitable for removing substantial thick ceramic-like materials, such as residual casting materials remaining on a cast part. Moreover, there is no suggestion or motivation in Hoffman to modify a casting material to be capable of disintegrating in an electrolytic device, by including a disintegration additive that consists essentially of an ionic compound that enables effective removal of the residual casting material from a cast part, as is generally recited in Claims 33-38, 40, and 46-59.

In light of the amendments to the claims, Applicants respectfully maintain that the cited references do not suggest the combination of teachings necessary to arrive at the presently claimed invention, and thus fail to establish *prima facie* obviousness. There is nothing in these references that would motivate the skilled artisan to combine these references without the impermissible benefit of hindsight. As such, Applicants respectfully submit that none of Johnson, Madono, or Hoffman, either alone or in combination provides the necessary disclosure, suggestion, or motivation to arrive at

the invention as claimed in Claims 33 -38, 40-41 and 46-59. Applicants respectfully request reconsideration of the claims and prompt allowance thereof.

**CONCLUSION**

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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